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Notes on Diatoms.

By C. Henry Kain.

Within the last few years the number of students of the Diatomaceæ has vastly increased. The literature of the subject has been greatly enriched, the classification of species is more definite, and the valuable aid afforded to geologists by the investigation of newly discovered fossil deposits has drawn attention to the fact that the study of these forms is not without practical results. The researches in regard to the structure of the diatom frustule, notably those of Dr. J. H. L. Flogel, Prinz and Van Ermengem, and Hon. J. D. Cox, while productive of much discussion, are likely to lead to valuable conclusions. Some observers are devoting their attention to the study of the life history of the Diatomaceæ, and the number of such students should be increased, for there are many points in this connection that require verification and further investigation. It is understood that our veteran diatomist, Prof. H. L. Smith, to whom we are indebted for the system of classification now so generally adopted, has prepared a work upon this subject, and its publication is hoped for at an early day. Very little has been done in this country in the way of figuring the species of particular districts, and monographs upon our remarkable fossil deposits would be very desirable.

Most unfortunately, many are only familiar with diatoms as they are received in a cleaned state, except, perchance, such as may be met with in a casual gathering of pond life. Such persons would often be pleased to make original collections, but for lack of knowledge in regard to where to look for and how to gather these little plants. This knowledge is only acquired after considerable experience. In the writer's early experience, most

of the collections made resulted in securing a few diatoms and a good deal of mud. The efforts to get rid of the fine silt were usually so vexatious that the whole lot was often thrown away in disgust. The collector should learn that it pays to gather specimens as free from extraneous matter as possible. It is far easier to do this on the spot than to depend upon the various devices used for getting rid of sand, etc., after cleaning. It is not difficult to make clean collections when one has learned where to look, when to look, and how to collect.

Along the coast of New Jersey and Long Island extends a series of shallow bays or sounds, which are separated from the sea by strips of sandy beaches. These bays abound in spots where various species of marine algæ flourish luxuriantly, and upon these algæ many species of marine diatoms frequently occur in great abundance. Frequent inlets connect the bays mentioned with the ocean, and it is at the mouths of these inlets, between tide marks, that the richest and purest gatherings of marine forms may often be obtained. Sand bars which are bare at low tide are often prolific spots, but the best places are usually in the little coves which are always found near the mouths of the inlets. Here the water forms gentle eddies, and the diatoms have a chance to settle. At the time of lowest tide, the sand ripples may often be found densely packed with diatoms, forming a deposit which varies, according to the species, from a light brown to a dark chestnut color. This deposit, with as little sand as possible, should be scraped up and put into a wide-mouthed bottle until it is perhaps one-third full. Then fill up with water and shake vigorously. Allow the sand to settle for a few moments, and pour off the water, which is now quite brown in color on account of the diatoms it retains. Again fill the bottle with water, shake, let settle and pour off as before. A number of bottles can be filled in succession in this way, and if those first filled are allowed to stand for fifteen or twenty minutes, the diatoms, unless they are some of the very small species, settle to the bottom. The supernatant water can then be poured off and the bottles again filled successively. In this way, a large collection of very clean material may frequently be made at one spot, during a single tide. A little collecting lens is almost indispens-

able in this work, for it often happens that after one has collected at one spot all he desires, another spot a few yards away attracts his attention, but, as it presents the same appearance to the eye, it is neglected. The collector should not pass any favorable looking spot without examination, for pure gatherings of quite distinct species may often be made within a few yards of each other. One other piece of advice may not be amiss. When one finds a really good gathering, be sure to collect *plenty* of it, for the same spot may be visited again at the very next tide, and either nothing collected, or the species found may be quite different.

It is our design to call attention to some localities along the New Jersey coast which have been found prolific, and the first of these to which reference will be made is Shark River, at Ocean Beach, on the New York and Long Branch Railroad, about nine miles below Long Branch. As it is easily reached by rail from either New York or Philadelphia, microscopists of those cities would be richly repaid for a visit to the locality. The writer is only familiar with the species found there during the months of July, August and September, but doubtless a visit during the open weather we sometimes have in winter would yield rich results, for some marine species flourish best during the winter months.

Early in July, in the sand ripples on the south side of the inlet of Shark River, *Cocconeis excentrica* may be found abundant and pure. It is needless, perhaps, to remark that the time of extreme low tide is the only proper time for making collections here. Some distance farther up the river, on the south side, near the foot of B street, a broad flat occurs which is bare at low water. Here *Navicula lyra*, *N. forcipata* and *N. humerosa* may be found, sometimes well separated. Still farther up the river, and on the same side, *Pleurosigma æstuarii* and many species of *Amphora* occur. A little farther up, at the foot of C street, the brown patches on the sand are usually worthy of investigation, for here pure gatherings of *Amphora* may be made; *A. plicata*, especially, is often found here in a very pure state. Later in the season, other forms may be met with in these localities, *Navicula inflexa*, particularly, being very abundant at the inlet, late in August.

On the north side of the river the species are often quité different from those on the south side at the same season. On this side, just within the inlet, is a large flat which is uncovered at low tide. Here various species of *Amphora* may be found; *A. aponina* being usually very abundant during August and September. On the more sheltered portion of this flat, where the flow of water has not been so rapid, the very delicate *Nitzschia closterium* may often be found in great abundance, also the tiny *Navicula oculata.* On some parts of this flat, however, the collector may meet with a great disappointment. Spots will be found where diatoms are very abundant, but so embedded in gelatinous matter as to be almost worthless, for this gelatinous material is very difficult to get rid of in cleaning. Besides, it retains a great deal of sand with the diatoms. The best plan is to avoid collecting such stuff, but collect as near the water's edge as possible. Here the diatoms have been washed clean by the constant action of the water and deposited in little winrows along the sand-ripples, the flocculent matter having been washed away. Upon the large flat just east of the wagon bridge, *Navicula lyra* and *N. forcipata* may often be found abundantly, but the collections made here are not apt to be so pure. Besides the species enumerated as occurring nearly pure, there are many other species which may be found more or less abundantly in mixed gatherings. These may be gleaned from the list at the close of this paper.

Above the railroad bridge, the river broadens out into a bay over a mile in width, and this is a veritable treasure house to the diatomist. In some parts of this bay, at certain seasons, the growth of algæ is so dense that it is difficult to row a boat through it. In June there is comparatively little to be found here, but, as the season advances, the growth of algæ and of diatoms is more prolific. By the second or third week in August, *Achnanthes brevipes* is exceedingly abundant upon *Polysiphonia Harveyi*, about two hundred yards west of Buhler's wharf. Farther west, *Striatella unipunctata*, *Synedra fulgens*, the ordinary species of *Grammatophora*, *Epithemia musculus* and *Melosira nummuloides* are often very abundant. Here every piece of seaweed should be separately inspected and so

placed in bottles as to mix species as little as possible. A mile west of Buhler's, in the shallow water at Long Point, cream-like masses of pure *Melosira nummuloides* may be sometimes met with. On the north side of the river, a little above where the north channel opens out into the bay, *Schizonema Americanum* grows in great abundance. It makes its appearance in light brown tufts upon eel-grass, about the last week in July, and continues for ten days or two weeks, varying somewhat in the time of its appearance in different seasons. Amongst it may sometimes be found *Berkleya fragilis*, a species which, like the Schizonemæ, also occurs in gelatinous fronds.

Between the railroad and the broad part of the bay are a number of islands, and, in the shallow pools found on these, very interesting collections of mixed species may be made. The wonderful *Bacillaria paradoxa* is abundant, and several species of *Pleurosigma* are found in considerable numbers.

Occasionally after a heavy easterly storm, but frequently at other times, the tide carries in from the sea great quantities of several of the smaller species of algæ. Upon these, *Licmophora tincta*, *L. flabellata* and the various species of *Grammatophora* are often very abundant. On such occasions the collector has but to anchor his boat in the current and catch the specimens as they float by, examining each separately. They should be so placed in bottles as to keep the various species as well separated as possible. Valuable collections may often be made in this manner.

The appended list of species is by no means exhaustive, as every new gathering is likely to furnish others not previously observed. The collections were made principally during the months of July and August, and extend over a period of about six or seven years.

Diatomaceæ of Shark River, N. J.

Achnanthes brevipes, Agardh, common on algæ, south side of bay.
Amphiprora lepidoptera, Greg., occasional, south side, foot of B street.
Amphora aponina, Greg., abundant and pure on flat near inlet.

A. cymbifera, Greg.
A. excisa, Greg.
A. lævis, Greg.
A. lævissima, Greg.
A. lanceolata, Cleve.
} common near inlet.

A. naviculacea, Donkin, occasional, near inlet.
A. obtusa, Greg., common near inlet.
A. plicata, Greg., abundant and pure, south side, foot of C street.
A. proteus, Greg., common, foot of B street.
A. robusta, Greg., common, near inlet.
Bacillaria paradoxa, Gmelin, (*Nitzschia paradoxa*, Grun.), common in ditches and pools west of railroad bridge.
Berkleya fragilis, Grev., on eel-grass, south side of bay, August 1.
Biddulphia aurita, Breb., occasional on algæ in bay.
B. Baileyi, W. Smith, occasional near inlet and in river mud.
B. lævis, Ehr., occasional near inlet and on algæ in bay.
B. pulchella, Gray, occasional on algæ in bay.
B. rhombus, W. Sm., occasional near inlet and in mud.
B. turgida, W. Sm., occasional near inlet and in mud.
Campylodiscus cribrosus, W. Sm., occasional near inlet and in mud.
Cocconeis excentrica, Donkin, abundant and pure, south side, near inlet, July.
C. scutellum, Ehr., abundant on algæ, particularly *Ceramium*, and on zoöphytes, especially *Sertularia*.
Coscinodiscus eccentricus, Ehr.
C. lineatus, Ehr.
C. omphalanthus, Ehr.
C. radiatus, Ehr.
C. subtilis, Ehr.
} occasional near inlet and in mud.

Dimeregramma marinum, Ralfs, occasional near inlet.
Epithemia (*Hantzschia*) *marina*, Donkin, near inlet.
E. musculus, Kütz., common on algæ, south side of bay.
Grammatophora islandica, Ehr.
G. marina, Kütz.
G. serpentina, Ehr.
G. subtilissima, Bailey.
} on small brown algæ floating in from sea.

Homœocladia sigmoidea, W. Sm. (*Nitzschia fasciculata*, Grunow), common in ditches near railroad bridge.

Licmophora flabellata, Agardh, on algæ in bay.

L. tincta, Grun., abundant on small floating algæ and on zoöphytes.

Melosira nummuloides, Agardh, abundant in bay near Long Point.

M. sulcata, Kütz., common near inlet and in mud.

Navicula forcipata, Grev., common, on flat near bridge and foot of B street.

N. granulata, Breb., rare, near inlet.

N. Hennedyi, W. Sm., common, near inlet and on flat near bridge.

N. humerosa, Breb., abundant, foot of B street.

N. Indica, Grev., occasional, near inlet and on flat near bridge.

N. inflexa, Ralfs, abundant and pure, in sand ripples near inlet, south side.

N. lyra, Ehr., abundant, on flats near wagon bridge and at foot of B street.

N. oculata, Breb., common, on flat near inlet, north side.

N. palpebralis, Breb., occasional, near inlet.

N. permagna, Bailey, occasional, at foot of B street and in mud.

N. peregrina, Ehr. (*Pinnularia*), ommon, in ditches on north side near bridges.

N. prætexta, Ehr., common, near inlet at foot of B street.

N. pygmæa, Kütz., occasional, near inlet.

N. retusa, Breb., occasional, near inlet.

Nitzschia bilobata, W. Sm., occasional, near inlet.

N. closterium, W. Sm., abundant, on flat near inlet, north side.

N. littorea, Grun., occasional, near inlet.

N. longissima, Ralfs., occasional, near inlet, north side.

N. marina, Grun., common, at foot of B street.

N. vivax, W. Sm., common, at foot of B street.

Pleurosigma Balticum, W. Sm., common, in pools above railroad.

P. angulatum, W. Sm., occasional, in pools above railroad.

P. fasciola, W. Sm., common, on flat near inlet, north side.

P. elongatum, W. Sm., occasional, near inlet.

P. hippocampus, W. Sm., common, near inlet and in pools above railroad.

P. decorum, W. Sm., occasional, near inlet.

P. macrum, W. Sm., occasional, on flat near inlet, north side.
P. obscurum, W. Sm., rare, on flat near inlet, north side.
Podosira compressa, West (*Druridgia geminata*), occasional, near inlet and in mud.
Rhabdonema Adriaticum, Kütz., common, on algæ in bay.
R. arcuatum, Kütz., common, with the last.
Rhaphoneis amphiceros, Ehr., occasional, near inlet and in mud; several varieties.
Schizonema Americanum, Grun., abundant, on eel-grass in bay, north side, Aug. 1.
Stauroneis aspera, Ehr., common, near inlet and at foot of B street.
S. salina, W. Sm., common, near foot of B street.
Striatella unipunctata, Agardh, abundant, on algæ in bay, south side.
Synedra fulgens, W. Sm., abundant, on algæ in bay, south side.
Triceratium alternans, Bailey, occasional, near inlet and on flat near bridge.
T. Favus, Ehr., occasional, near inlet and on flat near bridge.

Tryblionella angustata, W. Sm.,
T. Hantzschiana, Grun.,
T. punctata, W. Sm.,
T. scutella, W. Sm.,
} occasional, near inlet and in mud.

Note on the Inflorescence of Camellia Japonica.

Dr. Gray says that *Camellia Japonica* has "terminal or nearly terminal flowers" (F. F. and G. Bot., p. 76). Bentham and Hooker characterize the genus *Camellia* as having "flores axillares" (Gen. Plant., Vol. I., p. 187), and De Candolle makes exactly the same statement (Prod., Vol. I., p. 529). This contradiction led me to examine closely the inflorescence of a considerable number of plants of the common white, full-flowered variety of *C. Japonica*, and I am satisfied that the facts in the case are as follows: Each twig of one season's growth may or does produce one terminal leaf-bud and one leaf-bud in each axil. Each of these leaf-buds is or may be accompanied by two flower-buds, one on each side, and each subtended by a bract closely resembling the ordinary bud-scales. In other words, the flowers of *C.*